

RoentDek

UHV-Detectors **Handels GmbH**
Supersonic Gas Jets
Multifragment Imaging Systems

Position and time sensitive single photon detection for visible wavelengths (soft-UV to near-IR) with delay-line technique

Techniques like **LIF** (*Laser Induced Fluorescence spectroscopy*) and *Fluorescence Lifetime Imaging*, e.g. for microscopy (**FLIM**), require position and time sensitive detection of individual visible photons.

To extend the applicability of the MCP/delay-line technique for single photon detection from the VUV to longer wavelengths it is necessary to place a (transmission) *photo-cathode* in front of the MCP: A single photon is converted into a low energy electron by photo effect with a given quantum efficiency of a few 10%.

Photo-cathode performance in the photon spectrum from soft-UV to near-IR is much affected by ambient air. Such cathodes must be vacuum-sealed inside a so-called *image intensifier* tube, together with the MCP and the read-out anode (see for example <http://www.photek.com>).

Photek*, a renowned manufacturer of image intensifier tubes, has produced the first tubes with helical wire delay-line anode.

Recently, an image intensifier with 75mm active bi-alkali photo-cathode and **RoentDek DL80** delay-line anode has been built (*right*).

The performance was tested with standard **RoentDek** front-end electronics (here: **NDLATR6**) and **HM1** TDC.



* **Photek Ltd.**, St. Leonards on Sea, UK, <http://www.photek.com>

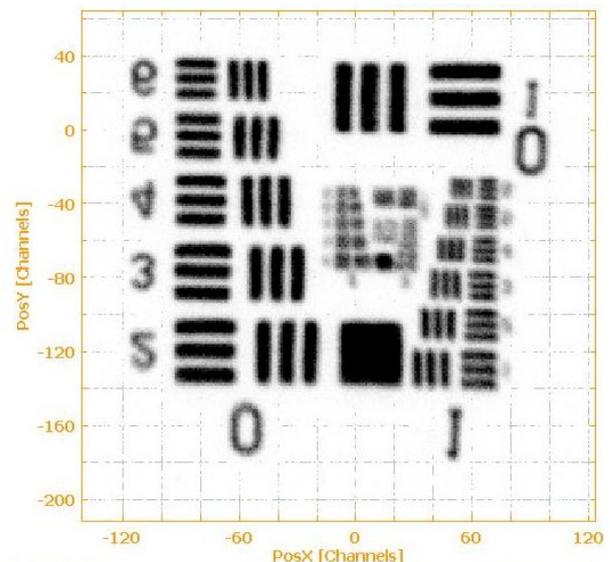
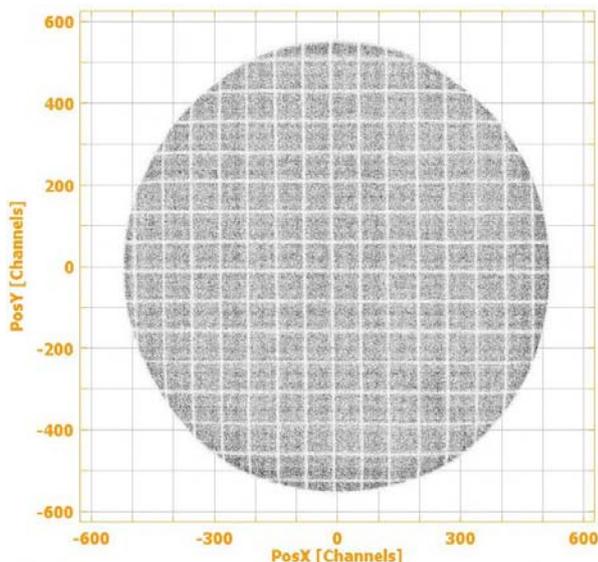
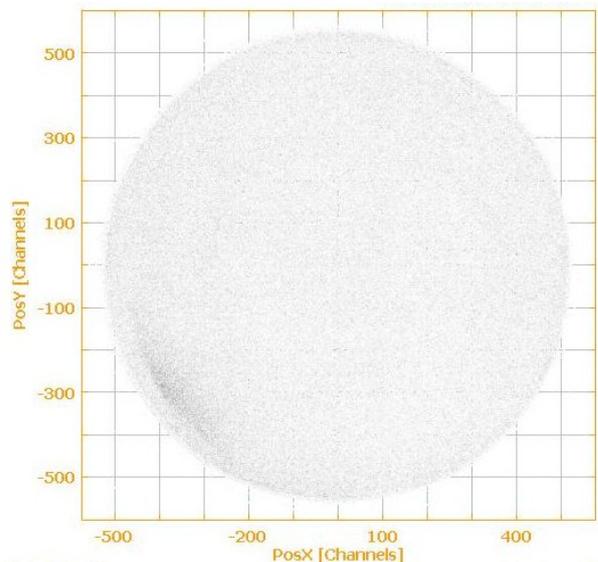
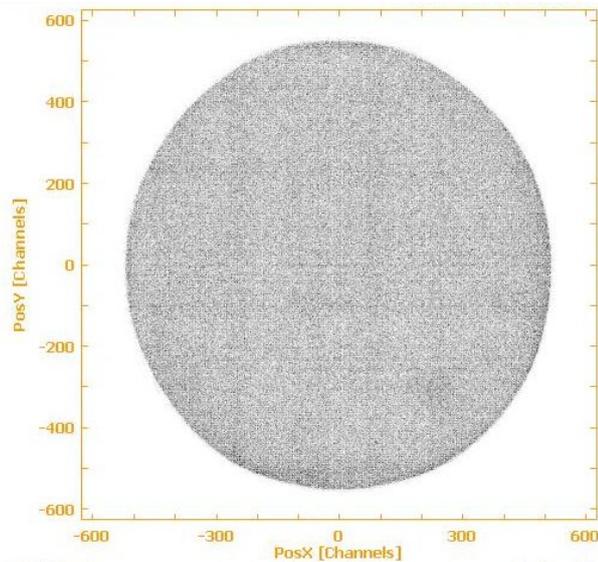
Images obtained with the **Photek** 75mm image intensifier with **RoentDek DL80** anode:

up left: flat field image, 15000 Photons/sec

up right: dark image, 500 counts/sec

below left: grid mask of 1mm obstacle every 5mm

below right: NASA test mask
resolution: 0.15mm FWHM *



* The resolution was limited by the **HM1** smallest time bin, which corresponds to 75 μm digital pixel size here. Better position resolution can be achieved by the choice of different TDC, e.g. the **TDC8HP**.